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M. Kelly
Dated 16 September 1999

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22JUL98 E377316-1 C43821
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The
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**Request for grant of a
Patent
Form 1/77**

Patents Act 1977

1 Title of invention

1 Please give the title of the invention **CASING RUNNING TOOL**

2 Applicant's details

First or only applicant **ROBERT PATRICK APPLETON**

2a If you are applying as a corporate body please give:

Corporate name

Country (and State of incorporation, if appropriate)

2b If you are applying as an individual or one of a partnership please give in full:

Surname **APPLETON**

Forenames **ROBERT PATRICK**

2c In all cases, please give the following details:

Address **GLENBURN HOUSE,
TORNAVEEN
BY BANCHORY
ABERDEENSHIRE**

UK postcode
(if applicable)

AB31 4NY

4314936003

Country

SCOTLAND.

ADP number
(if known)

2d, 2e and 2f: If there are further applicants please provide details on a separate sheet of paper.

Second applicant (if any)

2d If you are applying as a corporate body please give:

Corporate name

Country (and State
of incorporation, if
appropriate)

2e If you are applying as an individual or one of a partnership please give in full:

Surname

Forenames

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④ Address for service details

3a Have you appointed an agent to deal with your application?

Yes No **go to 3b**

↓
please give details below

Agent's name

Agent's address

Postcode

Agent's ADP
number

3b: If you have appointed an agent, all correspondence concerning your application will be sent to the agent's United Kingdom address.

3b If you have not appointed an agent please give a name and address in the United Kingdom to which all correspondence will be sent:

Name ROBERT PATRICK APPLETON

Address GLENBURN HOUSE
TORNAUEN
BY BANCHORY

Postcode AB31 4NY
ADP number
(if known)

Daytime telephone
number (if available) 013398-82447.

① Reference number

4 Agent's or applicant's reference number (if applicable)

② Claiming an earlier application date

5 Are you claiming that this application be treated as having been filed on the date of filing of an earlier application?

Yes No ➔ go to 6

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filing date

(day month year)

and the Section of the Patents Act 1977 under which you are claiming:

15(4) (Divisional) 8(3) 12(6) 37(4)

Please mark correct box
① If you are declaring priority from a PCT Application please enter 'PCT' as the country and enter the country code (for example, GB) as part of the application number.

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6 If you are declaring priority from previous application(s), please give:

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① The answer must be 'No' if:
 ● any applicant is not an inventor
 ● there is an inventor who is not an applicant, or
 ● any applicant is a corporate body.

② Inventorship

7 Are you (the applicant or applicants) the sole inventor or the joint inventor?

Please mark correct box

Yes No **A Statement of Inventorship on Patents**
 Form 7/77 will need to be filed (see Rule 15).

③ Please supply duplicates of claim(s), abstract, description and drawing(s).

④ Checklist

8a Please fill in the number of sheets for each of the following types of document contained in this application.

Continuation sheets for this Patents Form 1/77

Claim(s)

Description

Abstract

Drawing(s)

Please mark correct box(es)

8b Which of the following documents also accompanies the application?

Priority documents (please state how many)

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Patents Form 7/77 - Statement of Inventorship and Right to Grant
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Patents Form 9/77 - Preliminary Examination/Search

Patents Form 10/77 - Request for Substantive Examination

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CASING RUNNING TOOL

THIS INVENTION RELATES TO A TOOL FOR USE IN RUNNING CASING INTO A WELL BORE.

WHEN A WELL BORE IS DRILLED TO ANY SIGNIFICANT DEPTH, IT REQUIRES SUPPORTING FROM THE INSIDE TO PREVENT THE FORMATION FROM COLLAPSING INTO THE BORE OF THE WELL. THIS IS ACHIEVED BY RUNNING WHAT IS KNOWN AS CASING. i.e. STEEL PIPE THAT LINES THE BORE OF THE WELL AND IS NORMALLY CEMENTED IN PLACE TO PREVENT THE BORE HOLE FROM COLLAPSING IN ON ITSELF.

THE BORE IS NORMALLY DRILLED AND THE THE CASING IS RUN BY UTILISING WHAT IS COMMONLY KNOWN AS 'ELEVATORS'. ELEVATORS ARE TOOLS THAT ARE HINGED IN THE CENTRE AND HAVE A LATCHING MECHANISM TO LOCK THEM IN PLACE BELOW AN UP-SET, OR COUPLING ATTACHED TO THE TOP OF THE CASING JOINT. THE JOINTS OF CASING ARE NORMALLY PICKED UP ONE JOINT AT A TIME INTO THE DERRICK AREA OF THE RIG. THE JOINT IS THEN LOWERED INTO THE FEMALE, (OR BOX) CONNECTION OF THE PREVIOUSLY RUN JOINT, AND THE THREADED CONNECTION IS THEN SCREWED TOGETHER BY MEANS OF A FORM OF SPINNING WRENCH, OR POWER TONG.

IT IS NECESSARY TO FILL THE CASING STRING AT INTERVALS TO PREVENT 'FLOATATION' OF THE CASING STRING, AND ALSO TO MAINTAIN A SATISFACTORY 'HYDROSTATIC HEAD' WITHIN THE CASING STRING.

THERE MAY ALSO BE CIRCUMSTANCES WHEN IT IS DESIRABLE TO 'CIRCULATE', i.e. PUMP DOWN THE CASING STRING SHOULD HOLE CONDITIONS DICTATE.

TODAY'S CASING STRINGS ARE BECOMING VERY LONG IN LENGTH, AND ULTIMATELY INCREDIBLY HEAVY. THIS USUALLY MEANS THE REQUIREMENT TO RUN VERY LARGE ELEVATORS THAT HANDLE THE REQUIRED LOAD, AND ALSO DEAL WITH HOLE CONDITIONS THAT MAY CAUSE ABNORMAL LOADING ON THE EQUIPMENT.

THERE IS ALSO A THEORY THAT, 'BEING ABLE TO ROTATE THE CASING STRING' MAY OFFER ADDITIONAL ADVANTAGES.

IT IS AMONG THE OBJECTIVES OF EMBODIMENTS OF THE PRESENT INVENTION WHICH WILL PROVIDE A TOOL THAT WILL FACILITATE THE RUNNING OF A CASING STRING INTO A WELL BORE, COMPRISING: -

- (a). A GRAPPLE COMPLETE WITH A WEDGE LOCKING MECHANISM.
- (b). A HYDRAULIC MECHANISM FOR LOCKING AND UNLOCKING THE GRAPPLE & WEDGE LOCK MECHANISM, THUS PROVIDING A 'POSITIVE LOCK' SITUATION.
- (c). A COMPRESSION SPRING PROVIDED WITHIN THE HYDRAULIC LOCK PISTON APPLYING 'POSITIVE LOCKING' TO THE GRAPPLE AND WEDGE LOCK ARRANGEMENT.
- (d). A CHECK-VALVE THAT WILL PREVENT MUD SPILLAGE DURING FILLUP AND CASING CIRCULATION.
- (e). AN INFLATABLE OF PRESSURE OPERATED PACK-OFF THAT WILL PERMIT FILLUP OR CASING CIRCULATION TO TAKE PLACE AT ANY GIVEN TIME ONCE INSTALLED WITHIN THE CASING STRING.
- (f). A CONNECTION FOR CONNECTING THE DEVICE TO THE RIG BASED EQUIPMENT FOR RUNNING CASING INTO A WELL BORE.

THE PRESENT INVENTION ALSO RELATES TO A METHOD OF UTILISING SUCH A TOOL,-- IN USE THE TOOL WOULD BE CONNECTED TO EITHER A TOP-DRIVE UNIT VIA A THREADED CONNECTION, OR FROM A KELLY DRIVEN RIG VIA A PUP JOINT LATCHED INTO AN ELEVATOR. BOTH SITUATIONS HAVE AVAILABLE A MEANS OF CONNECTING UP TO A CIRCULATING SYSTEM THAT WILL PERMIT THE CASING TO BE FILLED OR CIRCULATED AT ANY TIME DURING THE RUNNING OPERATION.

CASING IS NORMALLY RUN BY PICKING UP A 'JOINT' AT A TIME, UTILISING SINGLE PICKUP ELEVATORS TO BRING THE JOINT INTO THE DERRICK AND CONNECT IT TO THE PREVIOUSLY RUN JOINT, WHETHER IT BE BY THREADED CONNECTION OR 'MECHANICAL LATCHING OR LOCKING'. THE TWO JOINTS ARE EITHER SCREWED OR LOCKED TOGETHER AND THEN LOWERED INTO THE WELL BORE USING 'ELEVATORS'.

WITH HEAVY CASING STRINGS IT IS REQUIRED THAT VERY LARGE ELEVATORS BE USED TO BE ABLE TO HANDLE THE LOAD. THIS OFTEN MEANS THAT THE TOP OF THE CASING JOINT MUST BE SET 8—10 FT. ABOVE THE RIG FLOOR TO PERMIT DIS-ENGAGEMENT TO

TAKE PLACE. SCAFFOLDING IS OFTEN REQUIRED FOR THE RIG CREWS TO BE ABLE TO STAB OR CONNECT THE NEXT JOINT TO THE STRING. IT IS ALSO NORMAL TO EITHER UTILISE A SEPARATE PACK-OFF ASSEMBLY, OR A FILLUP HOSE THAT MUST BE INSTALLED BY THE RIG CREW AFTER IT HAS BEEN LOWERED AND SET IN THE SLIPS. UTILISING THE PRESENT INVENTION WILL PERMIT THE CASING TO BE PICKED UP BY THE SINGLE PICKUP ELEVATORS,-- CONNECTED EITHER BY ROTATION OR MECHANICAL LATCH, AND THEN THE CASING RUNNING TOOL TO BE 'STABBED' INTO THE BORE OF THE TOP JOINT WITHOUT DAMAGE, DUE TO THE RUBBER BULL-NOSE GUIDE. WHEN THE TOOL IS AT THE CORRECT DEPTH OF PENETRATION WITHIN THE CASING BORE, THE HYDRAULIC PISTON IS ACTUATED TO DRIVE THE GRAPPLE DOWN ONTO THE WEDGE LOCK AND SECURE THE GRAPPLE TO THE CASING WALL. AS THE CASING STRING IS LIFTED, THE WEDGE-LOCK CONTINUES TO DRIVE INTO THE GRAPPLE BORE, PROVIDING AN EVER INCREASING WEDGE LOCK. THERE IS ALSO A COMPRESSION SPRING INSTALLED WITHIN THE HYDRAULIC PISTON TO ASSIST, AND PROVIDE A 'POSITIVE-LOCK' SHOULD THE HYDRAULIC SYSTEM FAILS FOR ANY REASON. THE PISTON WILL ALWAYS BE IN THE LOCK POSITION.

WHEN THE THE TOOL IS IN THE ENGAGED POSITION, IT IS THEN POSSIBLE TO, PUSH, PULL, OR EVEN ROTATE THE CASING STRING. TO BE ABLE TO ROTATE THE CASING STRING WILL REQUIRE THE INTRODUCTION OF A SEAL RING ASSEMBLY TO PERMIT CONSTANT CONTROL OF THE HYDRAULIC ACTUATING PISTON TO BE MAINTAINED. THIS TECHNOLOGY IS READILY AVAILABLE.

THE TOOL IS EQUIPPED WITH A THROUGH-BORE TO PERMIT CASING FILLUP AND CIRCULATION TO TAKE PLACE AT ANY TIME. THERE IS ALSO PROVIDED A PACK-OFF THAT CAN BE EITHER INFLATABLE OR FLOW PRESSURE OPERATED.

A SPECIFIC EMBODIMENT OF THE INVENTION WILL NOW BE DESCRIBED BY WAY OF EXAMPLE WITH REFERENCE TO THE ACCOMPANYING DRAWINGS IN WHICH :-

FIGURE 1. SHOWS IN PERSPECTIVE, THE CASING RUNNING TOOL WITHIN THE CASING JOINT, IN THE UNLATCHED, OR PRE-SET POSITION.

FIGURE 2. SHOWS IN PERSPECTIVE, THE CASING RUNNING TOOL WITHIN THE CASING JOINT, IN THE LATCHED, OR SET POSITION WITH THE GRAPPLE AND THE PACK-OFF IN CONTACT WITH THE CASING INNER WALL.

FIGURE 3. SHOWS IN PERSPECTIVE, THE CASING RUNNING TOOL WITH IT'S MAJOR COMPONENTS INDICATED.

FIGURE 4. SHOWS IN PERSPECTIVE, THE CASING RUNNING TOOL SEPARATED INTO MAJOR COMPONENTS.

REFERRING TO FIGURE (1). THE CASING RUNNING TOOL COMPRISSES A MAIN BODY (1) OR MANDREL WITH A THREADED CONNECTION (12), AT THE UPPER END TO PERMIT CONNECTION TO RIG LIFTING SYSTEM. MACHINED INTO, OR ATTACHED TO THE MAIN BODY (1), IS A HYDRAULIC CYLINDER (14), WITH A THREADED PORT AT OPPOSED ENDS, (10) AND (11), TO PERMIT HYDRAULIC FLUID TO BE INJECTED UNDER PRESSURE TO MANIPULATE THE HYDRAULIC PISTON, (2), WHICH IS SECURED WITHIN THE CYLINDER BY THE THREADED LOCK RING, (3). A COMPRESSION SPRING, (13), IS INSTALLED WITHIN THE CYLINDER, ABOVE THE PISTON TO APPLY DOWNWARD PRESSURE TO MAINTAIN A POSITIVE LOCK BETWEEN THE GRAPPLE, (4) AND THE WEDGE LOCK, (5). THE GRAPPLE (4), IS CONNECTED TO THE HYDRAULIC PISTON (2), BY A THREADED CONNECTION, AS IS THE GRAPPLE, (4) CONNECTED TO THE WEDGE LOCK, (5). IT SHOULD BE UNDERSTOOD THAT BOTH THE PISTON AND THE LOCK RING ARE FITTED WITH SUITABLE SEAL RINGS TO PREVENT HYDRAULIC FLUID LEAKAGE.

A MUD-CHECK VALVE, (6), IS THREAD CONNECTED AT THE LOWER END OF THE WEDGE LOCK, (5), AND THE UPPER BODY OF THE RUBBER PACK-OFF ASSEMBLY, (7), TO PREVENT

SPILLAGE OF THE DRILLING FLUID WHEN THE CASING RUNNING TOOL IS REMOVED FROM WITHIN THE CASING JOINT. THE PACK-OFF CAN BE ENERGISED BY EITHER INTERNAL MUD PRESSURE, OR EXTERNAL MUD FLOW.

THE CASING RUNNING TOOL IS LOWERED INTO THE CASING JOINT, WITH THE HYDRAULIC PISTON, (2), AND THE ATTACHED GRAPPLE, (4), IN THE UNLATCHED OR PRE-SET POSITION DUE TO HYDRAULIC FLUID BEING INJECTED THROUGH THE PORT (11). WHEN THE TOOL IS LOCATED AT THE CORRECT INSTALLATION DEPTH WITHIN THE CASING JOINT, THE PRESSURE AND FLUID IS RELEASED FROM PORT (11), AND HYDRAULIC FLUID IS INJECTED INTO PORT (10) THUS POWERING THE PISTON (2) AND THE GRAPPLE (4), DOWNWARD AGAINST THE WEDGE LOCK (5) TO FORM A MECHANICAL FRICTION GRIP ON THE CASING INNER WALL WITH THE SERRATED TEETH MACHINED INTO THE GRAPPLE (4). AS THE RIG LIFTING EQUIPMENT RAISES THE CASING RUNNING TOOL, THE WEDGE LOCK (5), IS PULLED UPWARD AGAINST THE INNER WALL OF THE GRAPPLE (4), ENSURING THAT CONSTANT OUTWARD PRESSURE IS BEING APPLIED TO THE GRAPPLE (4). THE MORE PULL INTRODUCED BY THE LIFTING EQUIPMENT, THE TIGHTER THE MECHANICAL GRIP BECOMES. SHOULD HYDRAULIC PRESSURE BE LOST FROM PORT (10), THE COMPRESSION SPRING, (13) ENERGY WILL ALWAYS MAINTAIN THE PISTON (2), IN THE LATCHED POSITION, THUS PREVENTING AN INADVERTENT RELEASE FROM TAKING PLACE.

THE CASING JOINT IS THEN LOWERED INTO THE WELL BORE AND SECURED AT RIG FLOOR LEVEL. THE CASING RUNNING TOOL IS PUT INTO THE 'NEUTRAL' WEIGHT POSITION, i.e. SUPPORTING IT'S OWN WEIGHT ONLY, AND THEN THE HYDRAULIC PRESSURE AND FLUID IS RELEASED FROM PORT (10), HYDRAULIC FLUID IS THEN INJECTED INTO PORT (11) AND THE CASING TOOL LOWERED SLIGHTLY TO RELEASE THE WEDGE LOCK (5) FROM THE GRAPPLE (4). THE HYDRAULIC PISTON (2) AND GRAPPLE (4) ARE RAISED INTO THE UNLATCHED, OR PRE-SET POSITION. THE CASING RUNNING TOOL IS THEN REMOVED FROM THE CASING JOINT AND THE PROCESS REPEATED.

CLAIMS

- (1). A CASING RUNNING TOOL COMPRISING A MAIN MANDREL OR BODY COMBINING A WEDGE LOCK ASSEMBLY AND A HYDRAULICALLY POWERED GRAPPLE TO APPLY A MECHANICAL FRICTION GRIP AGAINST THE INNER WALL OF A TUBULAR MEMBER WHICH MAY BE STEEL CASING, -- DRILLPIPE , OR ANY OTHER FORM OF TUBULAR TO BE RUN IN OR WITHDRAWN FROM A WELL OR OTHER BORE. THE GRAPPLE ALSO PERMITTING THE TUBULAR TO BE ROTATED IF REQUIRED.
THE HYDRAULICALLY POWERED GRAPPLE FITTED WITH A BACKUP 'POSITIVE LOCK' DEVICE SUCH AS A COMPRESSION SPRING TO PREVENT INADVERTENT RELEASE OF SAID GRAPPLE. THE MAIN MANDREL FITTED WITH A DEVICE TO PREVENT THE SPILLAGE OF DRILLING FLUID WHEN THE TOOL IS WITHDRAWN FROM THE TUBULAR MEMBER. THE MAIN MANDREL ALSO FITTED WITH A PACK-OFF, OR INFLATABLE DEVICE TO PERMIT THE TUBULAR TO BE FILLED WITH FLUID AND CIRCULATION PRESSURE TO BE APPLIED IF AND WHEN REQUIRED AND A STABBING GUIDE.
- (2). A CASING RUNNING TOOL AS CLAIMED IN CLAIM 1, WHEREIN THE GRAPPLE IS ATTACHED TO A HYDRAULIC TWO POSITION PISTON TO PERMIT MECHANICAL ENGAGEMENT OF THE GRAPPLE AGAINST THE WEDGE LOCK ASSEMBLY TO ENABLE MECHANICAL LIFT TO BE APPLIED TO THE TUBULAR MEMBER BY WAY OF A FRICTION LOCK.
- (3). A CASING RUNNING TOOL AS CLAIMED IN CLAIMS 1 & 2, WHEREIN THE HYDRAULIC PISTON IS HELD 'FAILSAFE' BY POWER FROM A COMPRESSION SPRING.
- (4). A CASING RUNNING TOOL AS CLAIMED IN CLAIMS 1,--2,--& 3, WHEREIN THE PISTON CYLINDER CAN BE EITHER MACHINED AS AN INTEGRAL PART OF THE MAIN BODY OR MANDREL, OR ATTACHED BY THREADING OR FLANGING.

- (5). A CASING RUNNING TOOL AS CLAIMED IN CLAIMS 1,--2,--3,&4, WHEREIN THE TUBULAR MEMBER OR MEMBERS CAN BE ROTATED SHOULD THE TOOL BE FITTED WITH A SUITABLE 'SLIP-RING' ASSEMBLY TO PERMIT THE INJECTION OF HYDRAULIC POWER FLUID INTO THE HYDRAULIC CYLINDER.
- (6). A CASING RUNNING TOOL AS CLAIMED IN CLAIMS 1 THROUGH 5, WHEREIN THE TOOL IS FITTED WITH AN ANTI- MUD SPILLAGE DEVICE.
- (7). A CASING RUNNING TOOL AS CLAIMED IN CLAIMS 1 THROUGH 6, WHEREIN THE TOOL IS FITTED WITH A PACK-OFF OR INFLATABLE PACKER TO PERMIT TUBULAR FILLUP, OR CIRCULATION OF THE TUBULAR STRING TO TAKE PLACE, AS AND WHEN REQUIRED.
- (8). A CASING RUNNING TOOL AS CLAIMED IN CLAIMS 1 THROUGH 7, WHEREIN THE TOOL CAN BE UTILIZED TO OPERATE WITH SEVERAL SIZES OF TUBULARS.
- (9). A CASING RUNNING TOOL AS CLAIMED IN ANY OF THE PRECEDING CLAIMS, WHEREIN THE TOOL IS FITTED A RUBBER BULL-NOSE GUIDE TO PREVENT DAMAGE TO THE TOP OF THE TUBULAR JOINT WHEN INSTALLING THE TOOL.
- (10). A CASING RUNNING TOOL AS CLAIMED IN ALL THE ABOVE, WHEREIN THE TOOL HAS A THROUGH BORE TO PERMIT FLUIDS TO BE CIRCULATED.
- (11). A CASING RUNNING TOOL SUBSTANTIALLY AS DESCRIBED HEREIN WITH REFERENCE TO FIGURES 1,-- 2,-- 3,-- & 4, OF THE ACCOMPANYING DRAWINGS.

ABSTRACT

A CASING RUNNING TOOL CAPABLE OF RUNNING AND RETRIEVING ALL TYPES AND SIZES OF TUBULARS INTO OR FROM A WELL OR OTHER BORE. UTILISING A HYDRAULICALLY

POWERED GRAPPLE (4) TO FORM A MECHANICAL FRICTION LOCK ON THE TUBULAR INNER WALL, ENABLING THE TUBULAR TO BE RAISED, -- LOWERED, OR ROTATED AT WILL. THE HYDRAULIC GRAPPLE HAVING A FAILSAFE LOCKING DEVICE, (13). THE TOOL HAVING A THROUGH BORE, (9) TO PERMIT FLUIDS TO PUMPED THROUGH THE TOOL. A MUD-CHECK DEVICE (6), IS INSTALLED TO PREVENT SPILLAGE OF FLUIDS ABOUT THE RIG SITE. A PACK-OFF OR INFLATABLE PACKER (7), IS INSTALLED TO PERMIT FILLUP AND CIRCULATION OF THE TUBULARS TO TAKE PLACE. A RUBBER BULL-NOSE OR GUIDE (8), IS EMPLOYED TO PREVENT DAMAGE TO THE TUBULAR TOP AS THE TOOL IS INTRODUCED.

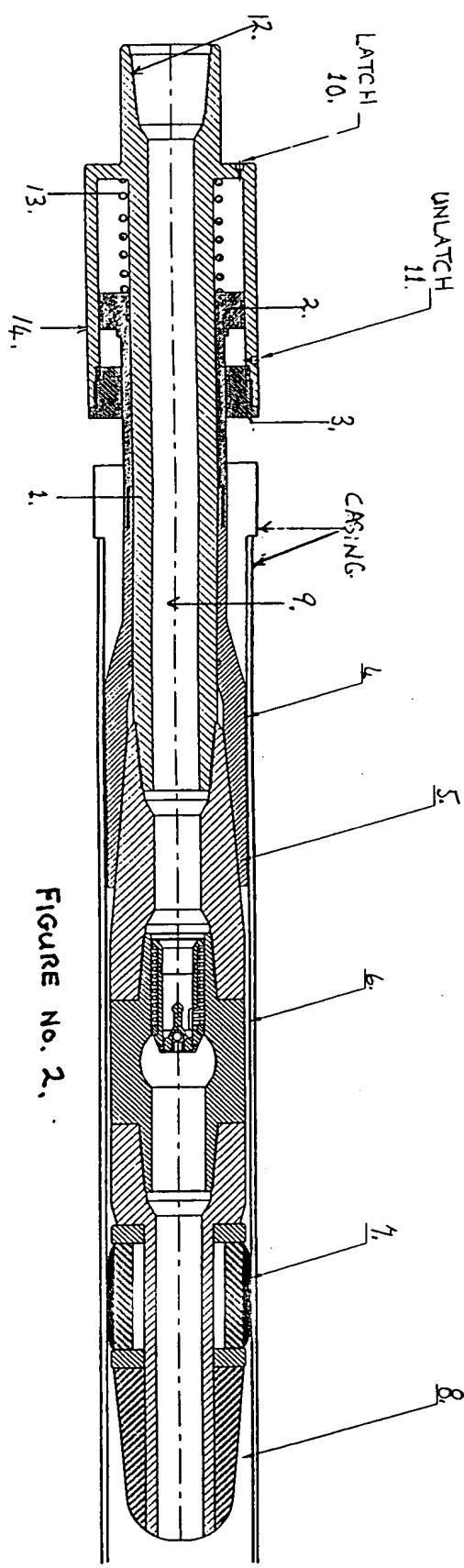


FIGURE NO. 2.

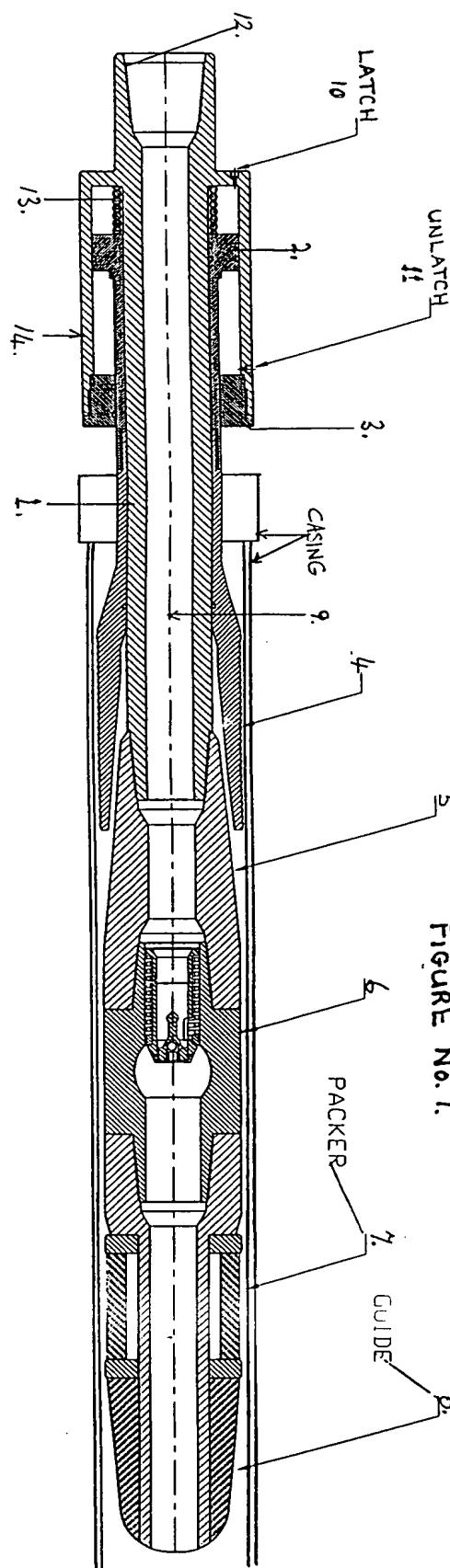


FIGURE No. 1.

1 OF 2

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FIGURE No. 3.

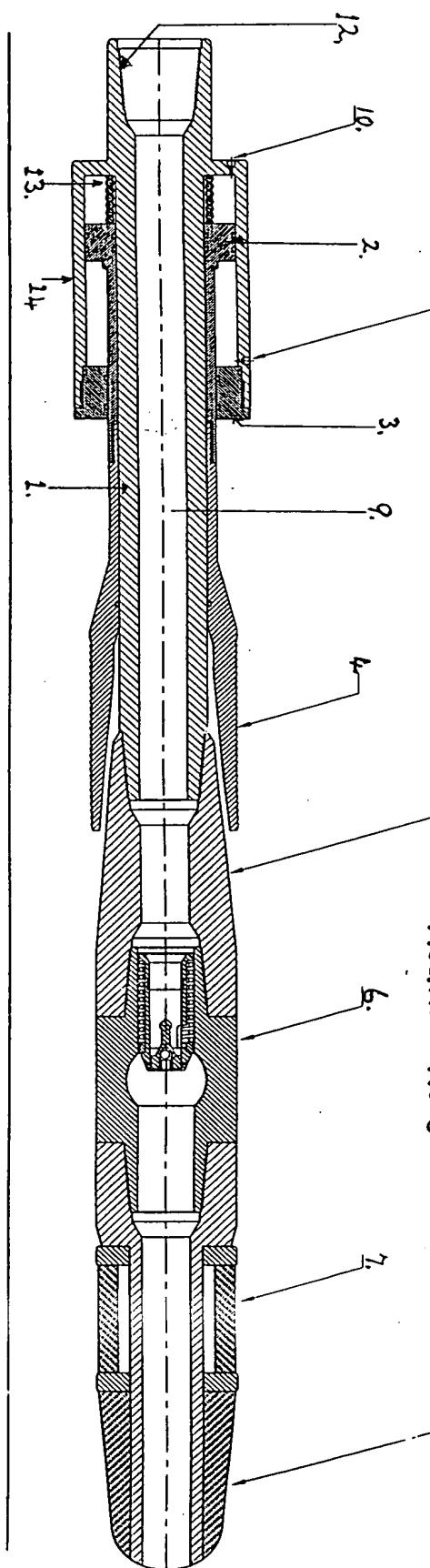
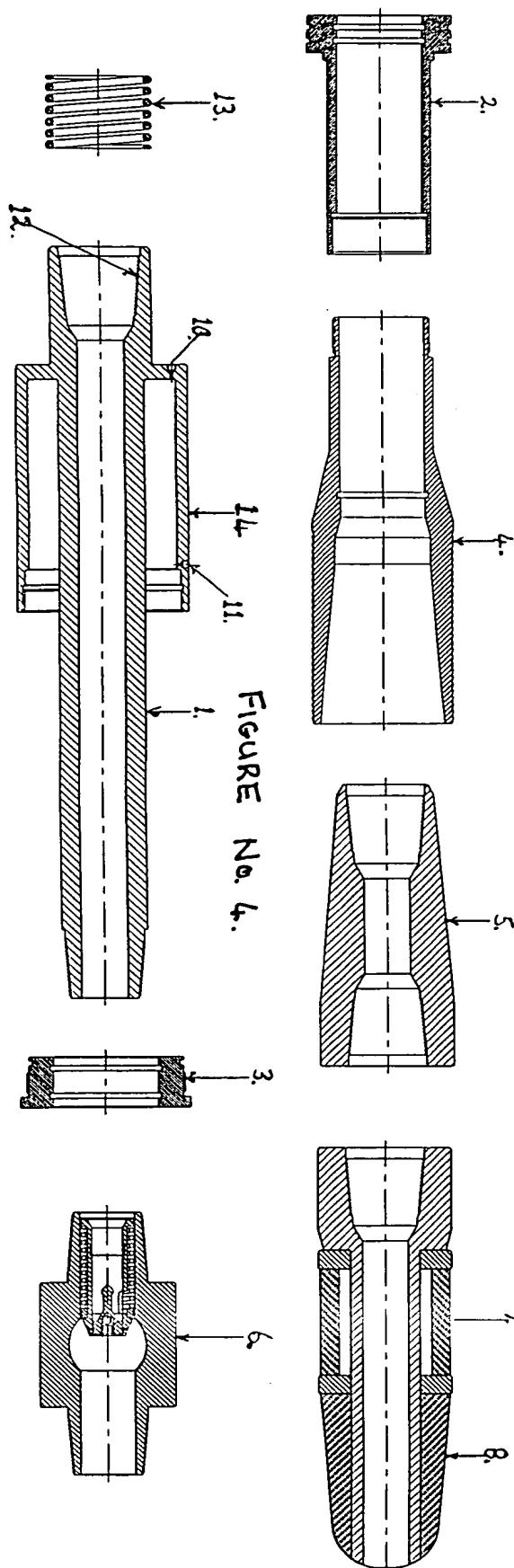


FIGURE No. 4.



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